• Course Number and Title:	M E 517. Nonlinear Dynamics and Chaos
• Catalog Description:	Singular points, periodic solutions, stability, and local bifurcations for ODEs and maps; phase space methods, invariant manifolds, and Poincare maps; nonsmooth, periodic, time-delay, and Hamiltonian systems; perturbation, averaging, and harmonic balance methods; center manifold reduction and normal forms; strange attractors, Liapunov exponents, attractor dimension; dissipative and Hamiltonian chaos
• Credit Hours:	3 Credits (3)
• Prerequisite(s) / Corequisite(s)	Prerequisite(s): None Corequisite(s): None
• Required:	Graduate Elective
• Course Availability:	Spring Semester
• Instructor (Usual):	Dr. Abdessattar Abdelkefi (See https://mae.nmsu.edu/people/faculty.html)
• Textbook:	1) A. H. Nayfeh and D. Mook, *Nonlinear Oscillations*, John Wiley & Sons, 1995 2) S. H. Strogatz, *Nonlinear Dynamics and Chaos*, Westview Press, 2001 3) A. H. Nayfeh, *Problems in Perturbation*, John Wiley & Sons, 1993
• Course Learning Objectives:	After completing this course, a student should be able to: 1) Qualitatively and quantitatively understand and determine the dynamical response of nonlinear systems. 2) Understand various nonlinear behaviors and concepts. 3) Use several perturbation techniques to solve the governing equations of motion. 4) Characterize the response of a nonlinear dynamical system.
• Topics Covered:	Phase portraits of Hamiltonian systems; vector field analysis; perturbation methods such as averaging, multiple-scales, and harmonic balance; primary, super/subharmonic, combination, internal resonances; parametric resonance and Floquet theory; map theory; logistic map and chaotic phenomena; Poincaré map; nonlinear normal modes